



BULLETIN 251B
GENERAL DESCRIPTION
AND
THEORY OF OPERATION
MODEL 28
TRANSMITTER DISTRIBUTOR
LAXD

TELETYPE[®]
CORPORATION
SUBSIDIARY OF *Western Electric Company* INC.
CHICAGO, ILLINOIS, U. S. A.

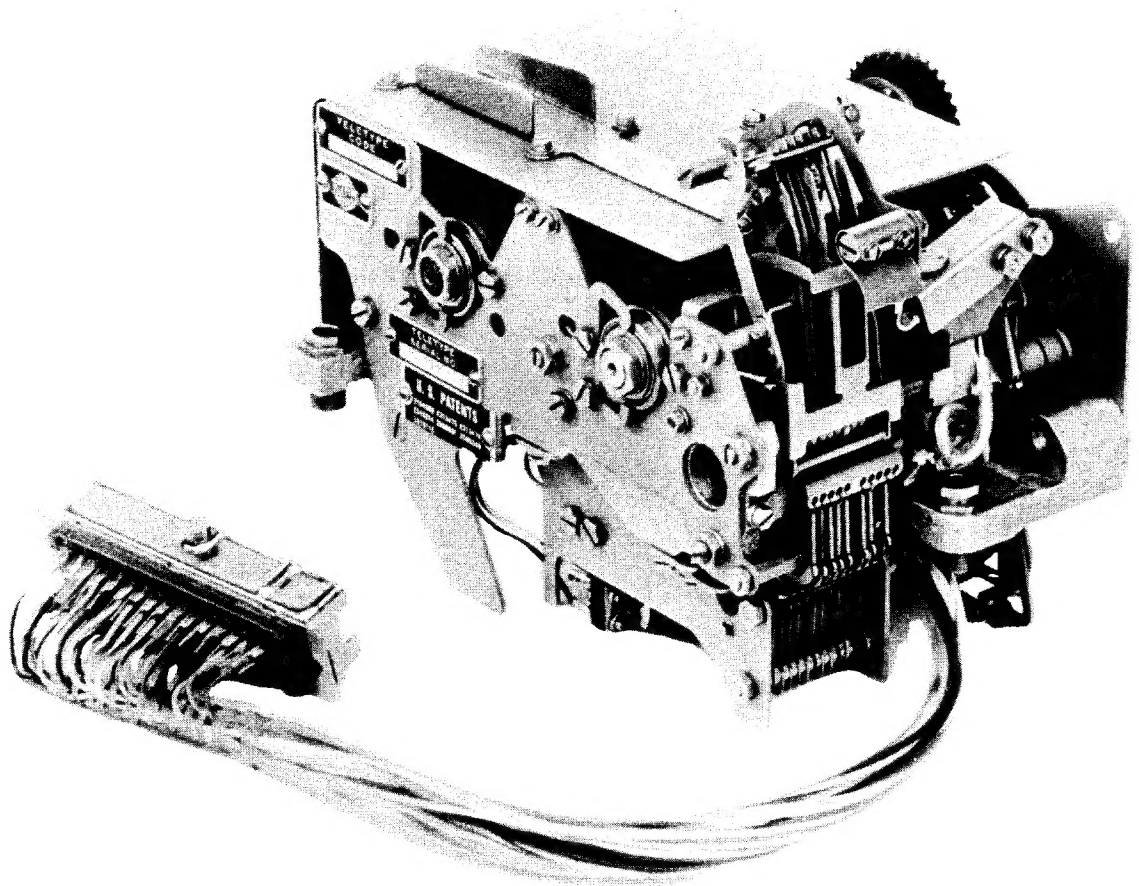
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LAXD - TRANSMITTER DISTRIBUTOR
(Pivoted head, multi-contact)

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SECTION 1

GENERAL DESCRIPTION

1. GENERAL

a. Function. (Figure 1-1) — The Model 28 two-shaft pivoted transmitter-distributor is a combined tape reader and distributor. The unit is designed to sense code combinations in perforated tape or code pulses from external multiple-wire input and to convert these codes into electrical code pulses for distribution over a signal circuit. Provision is made for either single-wire or multiple-wire output. This unit of equipment is a part of the Model 28 series of telegraph switching components and Automatic Send Receive Set.

b. Pivoted Reading Head. — The main feature of this equipment, which distinguishes it from other units of the Model 28 system, is the pivoted reading head. This mechanism is capable of reading either loose or climbing-up taut tape which emerges from an associated perforating mechanism. The pivoted head will climb up toward the associated perforating mechanism to read the last character perforated.

c. Features. (Figures 1-2, 1-3) — The pivoted transmitter-distributor incorporates the following features:

(1) Senses and transmits the last character perforated by its associated perforating unit.

(2) Sensing and distributor mechanisms capable of being actuated independently from either a local or remote source

(3) Wiring for reader, distributor, auxiliary contacts, clutch magnet, and last character switch terminates at a 32-point connector

(4) Accommodation of fully perforated and round or square chadless code perforations, and fully perforated, chadless or embossed feed holes

(5) Operating speeds up to 100 words per minute (7.42 unit code, or equivalent 7.00 unit code) with gear changes only (1-cycle) and up to 200 words per minute with gear and cam changes (2-cycle)

(6) Auxiliary contacts "A" and "B" operated from sensing cam for controlling external circuits and distributor mechanism

(7) Auxiliary contact "A" (2-cycle) and auxiliary contacts "A" and "B" (1-cycle) operated from distributor cam for control of external circuits

(8) Oil reservoir for extending lubrication intervals

(9) Spring biased hinged tape lid for simple foolproof tape insertion

(10) Five level tape handling facilities with provision for modification to six, seven or eight level tapes

(11) Tape-out pin retarded one-half character, actuating a normally-closed contact

(12) Device for directing tape loop into storage bin

(13) Remote control

2. COMPONENTS

a. Transmitter-Distributor. (Figures 1-2, 1-3) — A casting and two mounting plates provide support for the following mechanisms and units:

(1) Pivoted sensing head or yoke which houses the feed mechanism, sensing pins and tape-out pin

(2) Last character switch which is actuated by the yoke

(3) Tape deflector which is mounted in front of the yoke

(4) Tape depressor which rides above the yoke and is mounted on a cross bar between the mounting plates

(5) Sensing shaft and cam assembly which actuates the entire sensing mechanism

(6) Distributor shaft and cam assembly which actuates the distributor contacts through appropriate mechanism

(7) Two clutch trip mechanisms that control the action of the distributor and sensing shafts

(8) Storing switch that stores the sensed code combination for sequential transmission

b. Cover. — A cover is provided to protect the internal mechanisms from foreign material.

3. ELECTRICAL CHARACTERISTICS AND REQUIREMENTS

a. Signalling Code. (Figure 1-4) — The signalling code most generally transmitted is the five-unit, start-stop neutral code consisting of current and no-current intervals, or pulses. A marking pulse is a measured interval of time during which current flow is permitted through the closure of a contact. A spacing pulse is a measured interval of time during which the flow of current is interrupted through the opening of a contact. The transmission pattern for a complete character consists of a start pulse

(always spacing), five code pulses — any one of which may be either marking or spacing, and a stop pulse (always marking). The start and the stop pulses are to keep the receiving telegraph apparatus in synchronism with the transmitter.

b. Control Circuit Requirements. — The clutch trip magnets will operate from 110-120 volts d-c, or 45-55 volts d-c. Input current to each clutch trip magnet is approximately 0.160 amperes.

4. WEIGHT AND DIMENSIONS

a. Weight. — The Transmitter-Distributor weighs 6-1/2 lbs.

b. Dimensions. — Width (left to right) 7 inches; length (front to rear) 7-1/2 inches; height 6 inches.

SECTION 2

THEORY OF OPERATION

1. GENERAL

The description text in this section pertains to the sequence of operation of the pivoted transmitter-distributor under assumed conditions. These conditions are as follows:

a. Current applies to the distributor and sensing clutch trip magnet circuit

b. Power applies to the motor driving the unit

c. Tape inserted in the tape lid and tape lid closed

d. Sensing clutch trip magnet circuit connected in series with the last character contact and tape-out contact on storing switch

e. Distributor clutch trip magnet and auxiliary distributor clutch trip magnet contact on sensing cam connected in series

f. Storing switch contacts and distributor contacts connected in series with the signal line

g. Transmitter-distributor in idle line condition with pivoted sensing head against the punch block

2. GEARING

The distributor shaft assembly mounts two gears; the rear gear meshes with the intermediate gear train on the base and is driven from a motor. The clutch drum gear, through an idler gear, drives the sensing clutch drum gear to rotate the sensing and the distributor shafts at the same speed.

3. SUMMARY OF OPERATION SEQUENCE

a. Tape feeds from the reperforator, moving the pivoted sensing head away from the punch block. This actuates the last character switch and initiates sensing shaft rotation through the energized sensing clutch trip mechanism.

b. The sensing cam rotates to advance the tape, stripping previous stored character, sense the code perforations in the tape, and store the sensed character in the storing switch.

c. During the sensing cycle, the distributor clutch trip contact closes to initiate the distributor cycle through the energized distributor clutch trip mechanism. The distributor shaft rotates to actuate the distributor contacts and distribute a pattern of code pulses over the signal line which correspond to the code combination stored in the storing switch, i.e., the previously sensed character.

d. In continuous transmission, the sensing cam will have started its next cycle while the actions controlled by the distributor cam are taking place. These actions will continue until the sensing clutch trip magnet circuit is interrupted by the stop mechanism(s).

4. PIVOTED SENSING MECHANISM

a. Sensing Clutch Trip.

(1) Last Character Switch. (Figure 2-2) — As tape feeds from the reperforator, it moves the pivoted sensing head away from the punch block. An extension on the yoke actuates the last character switch contacts, closing the sensing clutch trip magnet circuit

(2) Clutch Trip Action. (Figure 2-3) — As the sensing clutch trip magnet is energized, its armature and armature extension bail are attracted to the magnet core, thus releasing the latching extension of the lower trip lever. The lower trip lever and the upper trip lever pivot on their shaft and the upper trip lever releases the clutch shoe lever from the stop lug on the clutch cam disk.

b. Clutch Engagement. (Figure 2-4) — Clutch engagement is accomplished by releasing the lower end of the clutch shoe lever, B. The upper end of the clutch shoe lever pivots about its ear, C (which bears against the upper end of the secondary shoe), and moves its ear, D, and the upper end of the primary shoe toward the left until the shoe makes contact with the drum at point E. As the drum turns counterclockwise, it drives the primary shoe downward so that it again makes contact with the drum, this time at point F. There, the combined forces acting on the primary shoe cause it to push against the secondary shoe at point G. The lower end of the secondary shoe then bears against the drum at point H. The revolving drum acts to

drive this shoe upward so that it again makes contact with the drum at point I. Since the forces involved are multiplied at each of the preceding steps, the final force developed at point I is very great. This force is applied to the lug J on the clutch cam disk to cause it to turn in step with the drum. The cam disk on the clutch is connected to the cam sleeve and engagement of the clutch starts the sensing cam sleeve rotating.

c. Clutch Reset. (Figure 2-3)

(1) As the sensing cam sleeve starts its rotation, the reset extension of the lower trip lever rides to the peak of its cam to place the upper trip lever in the path of the clutch shoe lever.

(2) Should the magnet remain energized, the armature will remain attracted to the magnet core and the armature extension bail will be prevented from latching the lower trip lever. Then, as the cam continues to rotate, the reset extension of the lower trip lever will ride to the low part of its cam and permit the upper trip lever to pivot out of the path of the clutch shoe lever. The cam will continue to rotate thus until the trip magnet is no longer energized.

(3) When the clutch trip magnet circuit is interrupted, the armature and armature extension bail will be released. Then, as the reset extension of the lower trip lever rides to the high part of its cam, the latching extension will be latched by the armature extension bail to hold the upper trip lever in the path of the clutch shoe lever. As the clutch shoe lever strikes the upper trip lever, the inertia of the clutch will cause it to rotate a slight additional amount and permit the clutch latch lever to fall into the notch in the cam disk. In this position, the clutch shoe is held in proximity to the stop lug on the clutch cam disk.

d. Clutch Disengagement. (Figure 2-5) — Disengagement is accomplished by bringing together lug A on the clutch cam disk and the lower end of the clutch shoe lever B. The upper end of lever B pivots about its ear C and allows its other ear D to move toward the right. The upper spring then pulls the two shoes together and away from the drum to stop rotation of the clutch and cam sleeve.

e. Tape Feed. (Figure 2-6) — As the sensing cam sleeve rotates, a roller on the feed lever rides to the high part of its cam, moving the feed pawl down. The feed pawl in its lowest position engages the next tooth on the feed ratchet. (The check pawl rests in the hollow between two of the feed ratchet teeth during the downward stroke of the feed pawl holding the ratchet in

position.) As the sensing cam continues to rotate, the feed lever roller rides to the low of its cam through spring action, which allows the feed pawl to move upward one tooth on the ratchet. The upward position of the feed pawl is governed by a bent ear on the yoke which wedges the feed pawl between the ratchet and the bent ear.

f. Tape Sensing. (Figure 2-7) — At the start of the sensing cam sleeve rotation, the sensing pins are in their downward position, withdrawn from the tape, and the storing switch contacts are arranged in accordance with the code combination of the previous sensed character.

(1) Pusher Bail. (Figure 2-8) — As the pusher bail roller rides to the peak of its cam, the pusher bail moves the push levers to the right, thus stripping any previously selected push levers from the shoulders of their transfer levers. Then, as the pusher bail roller rides to the indent of its cam, the pusher bail is withdrawn from the push levers to permit the levers to rest against their transfer levers.

(2) Sensing Bail. (Figure 2-9) — The sensing bail rollers move into the indent of their cams and the right end of the sensing bail rises to permit the sensing pins to rise and sense the code perforations in the tape. If the code level sensed by a pin is not perforated, travel of the pin is blocked by the tape and the push lever remains to the right of its sensing pin. If the code level is perforated, the pin is free to rise through the perforation sufficiently to permit the top of the push lever to drop under the shoulder of the transfer lever. Further rotation of the sensing cam sleeve will move the sensing bail rollers to the peak of their cams and start the right end of the sensing bail, the sensing pins and the selected push levers moving downward.

(3) Latch Bail. (Figure 2-10) — As the latch bail roller rides to the peak of its cam, the lower end of the latch bail will be moved to the left to actuate the latch levers. The lower end of the latch levers are moved to the right to release any previously latched slides and the slides will start to rise under the tension of their springs. If its push lever has not been selected, the slide is free to rise to its unoperated position. If its push lever has been selected, and moved downward by the transfer lever, the push lever will hold the slide down. Then, as the latch bail roller rides to the indent of its cam, the lower end of the latch bail will move to the right, permitting the latch levers to latch the slides in their operated position.

(4) Storing Switch. (Figure 2-11) — In its unoperated or upward position, the contact lever

slide holds the contact lever extension upward and the contact open. In its downward position, the slide permits the contact lever extension to move downward and close the contact. Thus, the code combination of the sensed character is stored in an arrangement of the storing switch contacts, and, on the next cycle of the distributor cam sleeve, will be transmitted sequentially over the signal circuit.

g. Auxiliary Contacts. (Figure 2-12) — The sensing cam actuates the following auxiliary contacts through the action of the auxiliary lever and the push levers, contact lever slides, contact lever extensions on the storing switch. The contacts are operated for each cycle of the sensing cam as follows:

(1) Auxiliary "A" contact closes at 20 degrees and opens at 118 degrees for 2-cycle operation. This contact closes at 40 degrees and opens at 262 degrees for 1-cycle operation.

(2) Distributor clutch trip magnet contact closes at 94 degrees and opens at 156 degrees for 2-cycle operation. The contact closes at 247 degrees and opens at 309 degrees for 1-cycle operation.

5. DISTRIBUTOR MECHANISM

a. Clutch Trip. The distributor clutch trip magnet is energized through the distributor clutch trip magnet contacts actuated by the sensing cam (para. 4.g.(2)). The action of the clutch trip mechanism and rotation of the distributor shaft is the same as the sensing mechanism (para. 4.a.(2) through 4.d.).

b. Distributor Contacts. (Figure 2-13) — The contacts of the storing switch assembly will have been arranged in conformance with the code combination of the last character sensed by the sensing mechanism. Then, as the distributor cam sleeve continues its rotation, the cam follower levers will be actuated by their cams to open and close the distributor contacts for measured intervals of time. Operation of the distributor contacts (in series with the storing

switch contacts) will generate a signal pattern corresponding to the code combination of the previously sensed character.

c. Auxiliary Contacts. (Figure 2-13) — An auxiliary "A" contact is provided which is actuated by the distributor cam through a cam follower lever. This distributor contact closes at 25 degrees and opens at 170 degrees for 2-cycle operation, and closes at 50 degrees and opens at 340 degrees for 1-cycle operation.

NOTE: A one cycle cam sleeve is available that incorporates the above auxiliary "A" contact in addition to an auxiliary "B" contact that closes at 94.6 degrees and opens at 312.9 degrees.

6. STOP MECHANISMS

a. Tape-Out Pin. (Figure 2-2)

(1) The tape-out (6th) pin senses that there is no tape in the transmitter distributor. Depending upon specific installation requirements, the tape-out (6th) pin contact may either (1) operate a warning device, or (2) open the sensing clutch trip magnet circuit, (3) or both. In the latter cases (2) or (3), the clutch trip magnet circuit is interrupted and the sequence of operation of paragraph 4.c.(3) occurs.

(2) The action of the tape-out pin is such that when there is tape in the pivoted sensing head, the tape-out pin is held in its downward position and the tape-out contact on the storing switch remains closed. When there is no tape in the sensing head, the tape-out pin slides upward through spring action and opens the contact.

b. Last Character Contact. (Figure 2-2) — Stopping the unit can also be accomplished through the last character contact. When tape stops feeding from the punch, the pivoted head climbs up the tape and after reading the last character, an extension on the yoke actuates the last character switch, opening the sensing clutch trip magnet circuit if it is wired in series.

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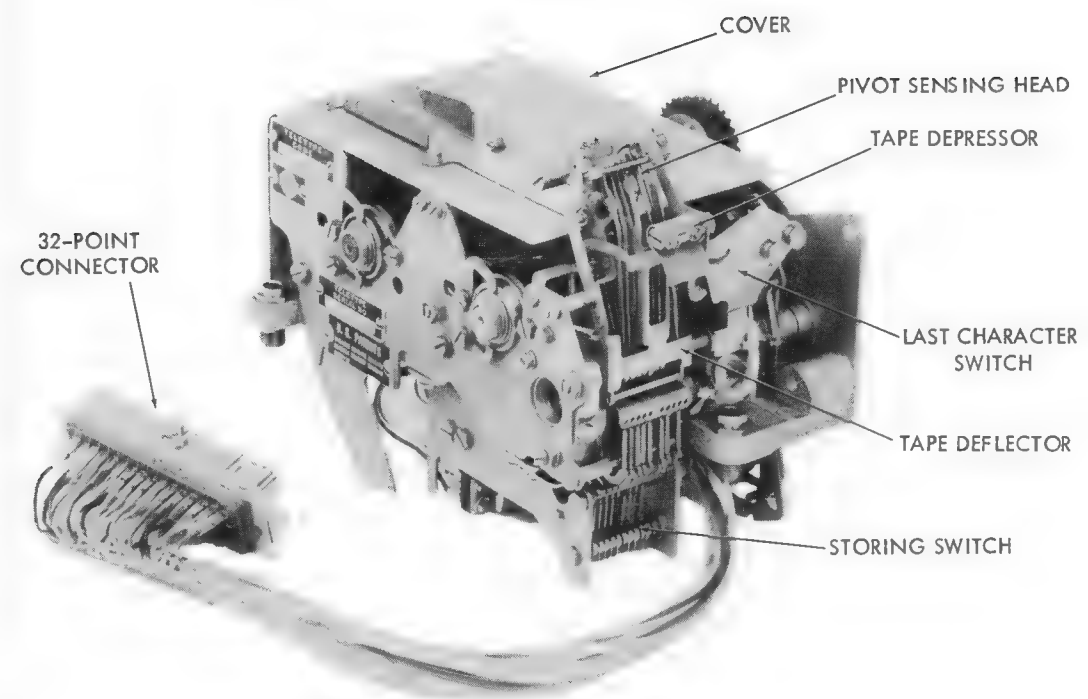


Figure 1-1. LAXD Pivoted Transmitter Distributor

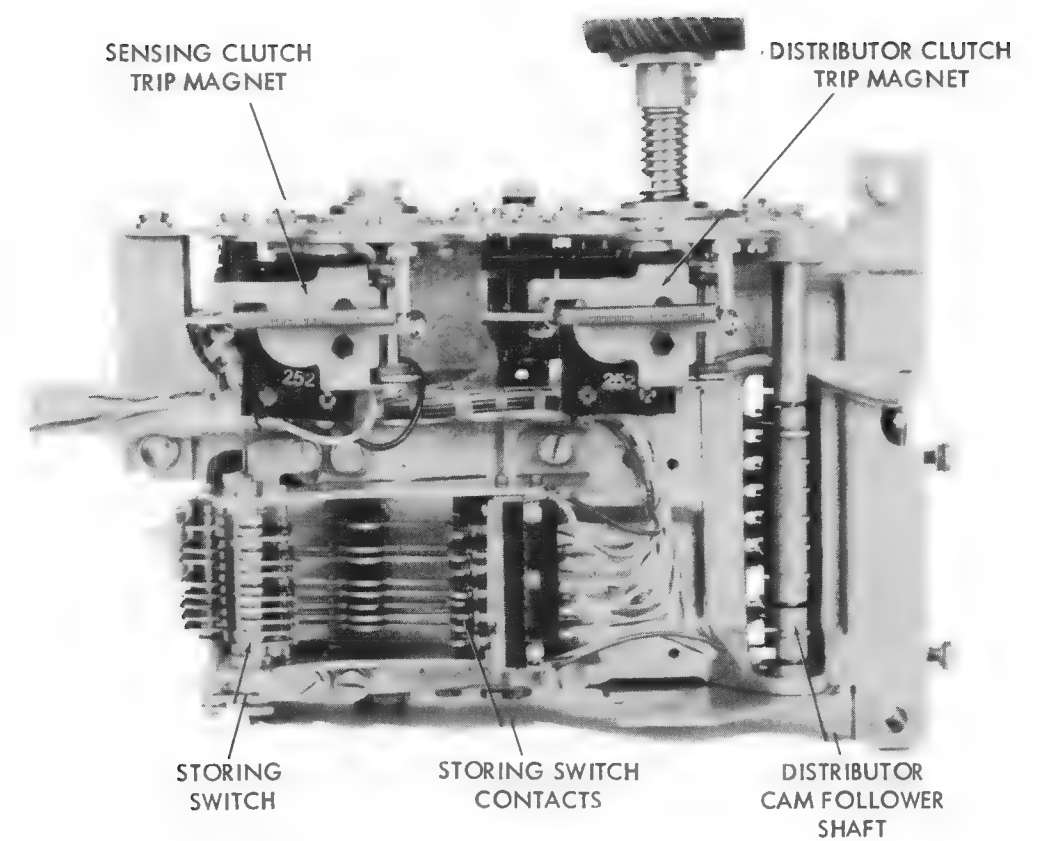


Figure 1-2. LAXD Pivoted Transmitter Distributor, Bottom View

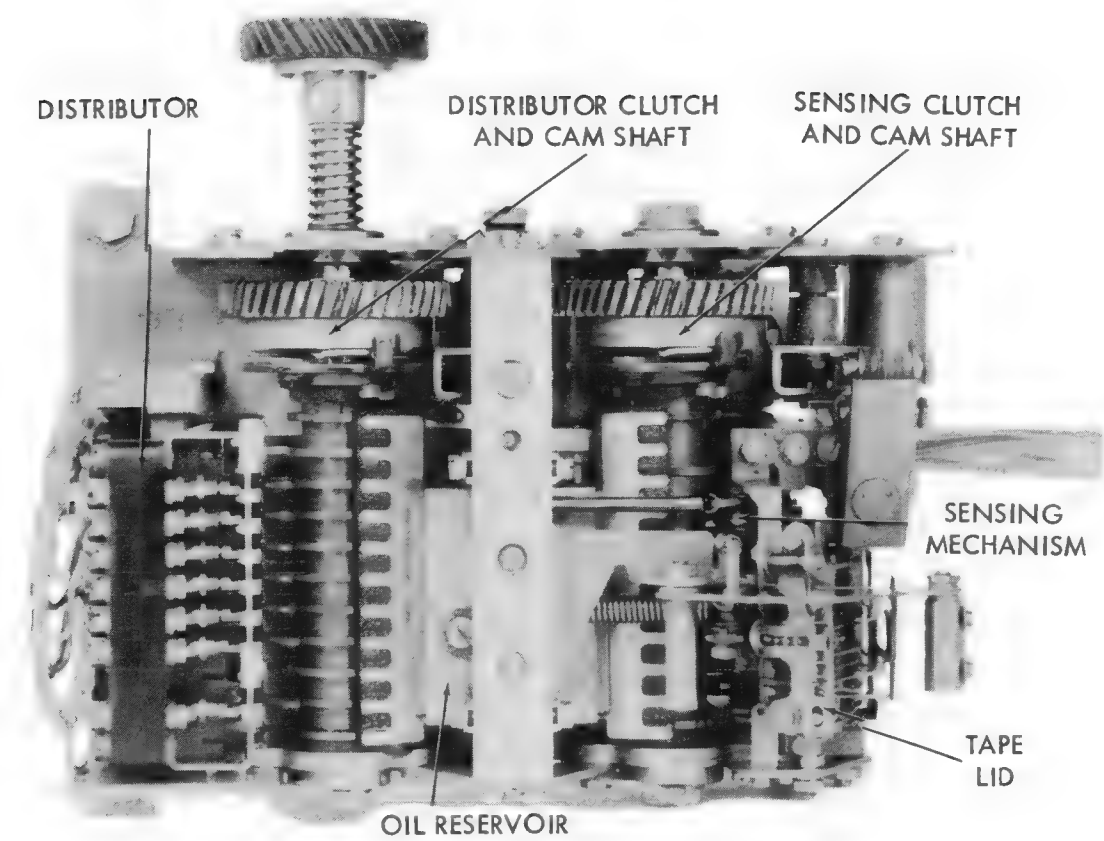


Figure 1-3. LAXD Pivoted Transmitter Distributor, Top View

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Figure 1-4. Typical Code Chart

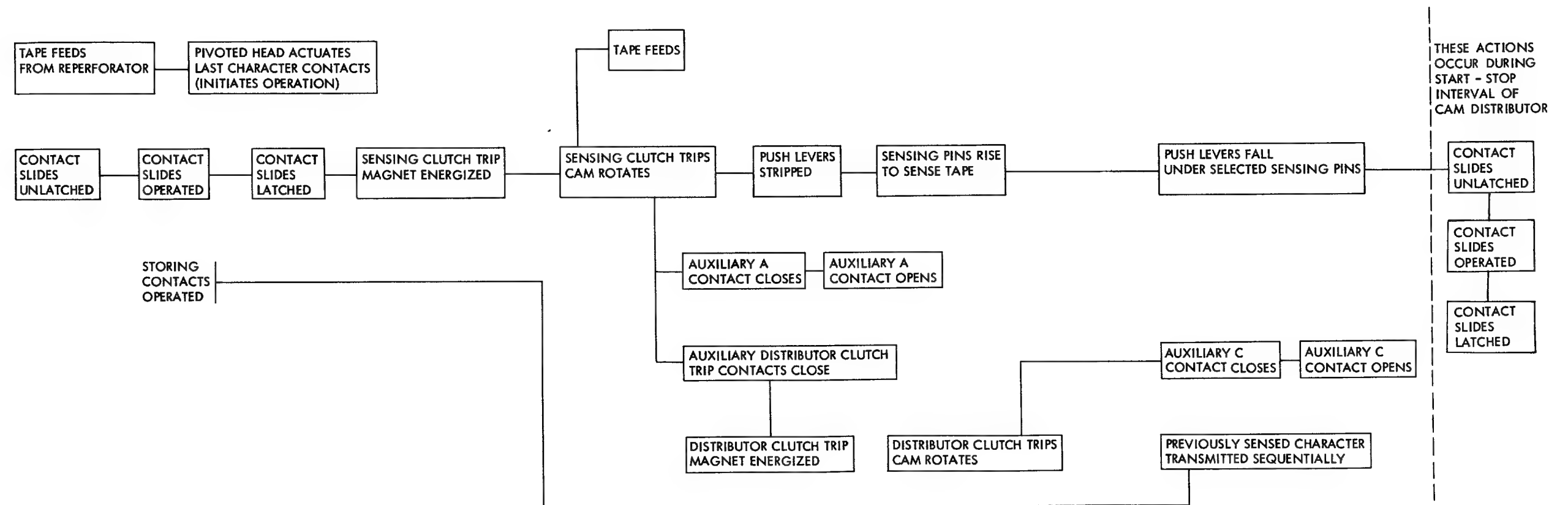


Figure 2-1. Functional Block Diagram

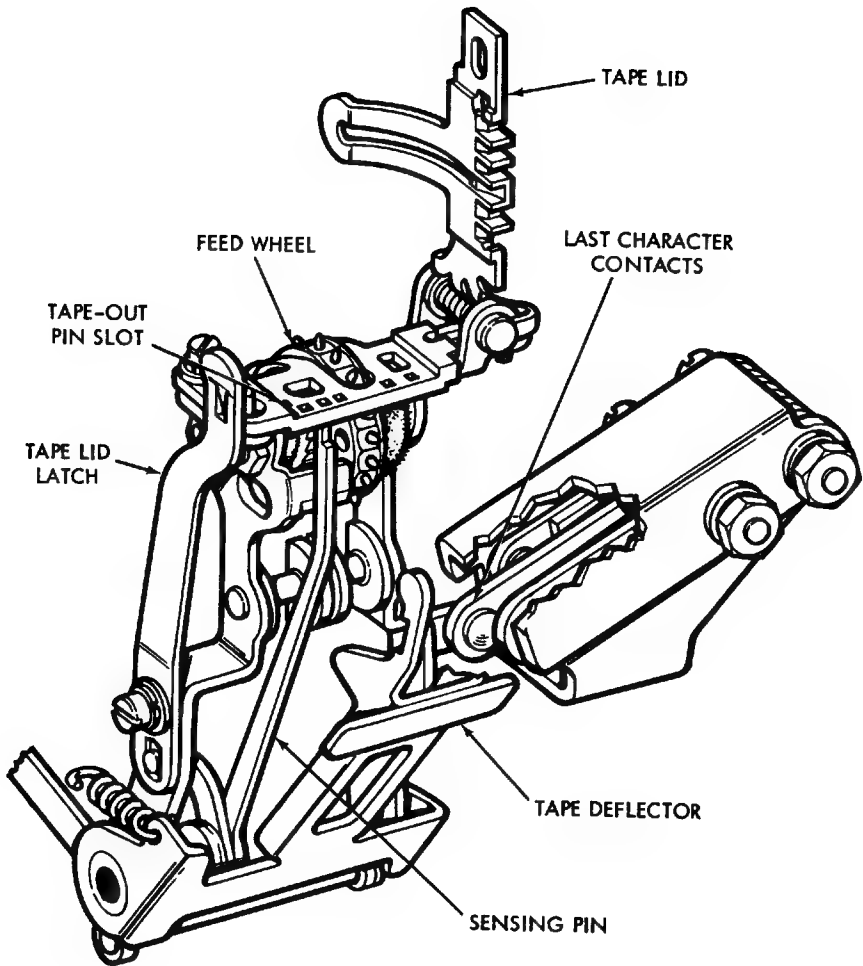


Figure 2-2. Pivoted Sensing Head

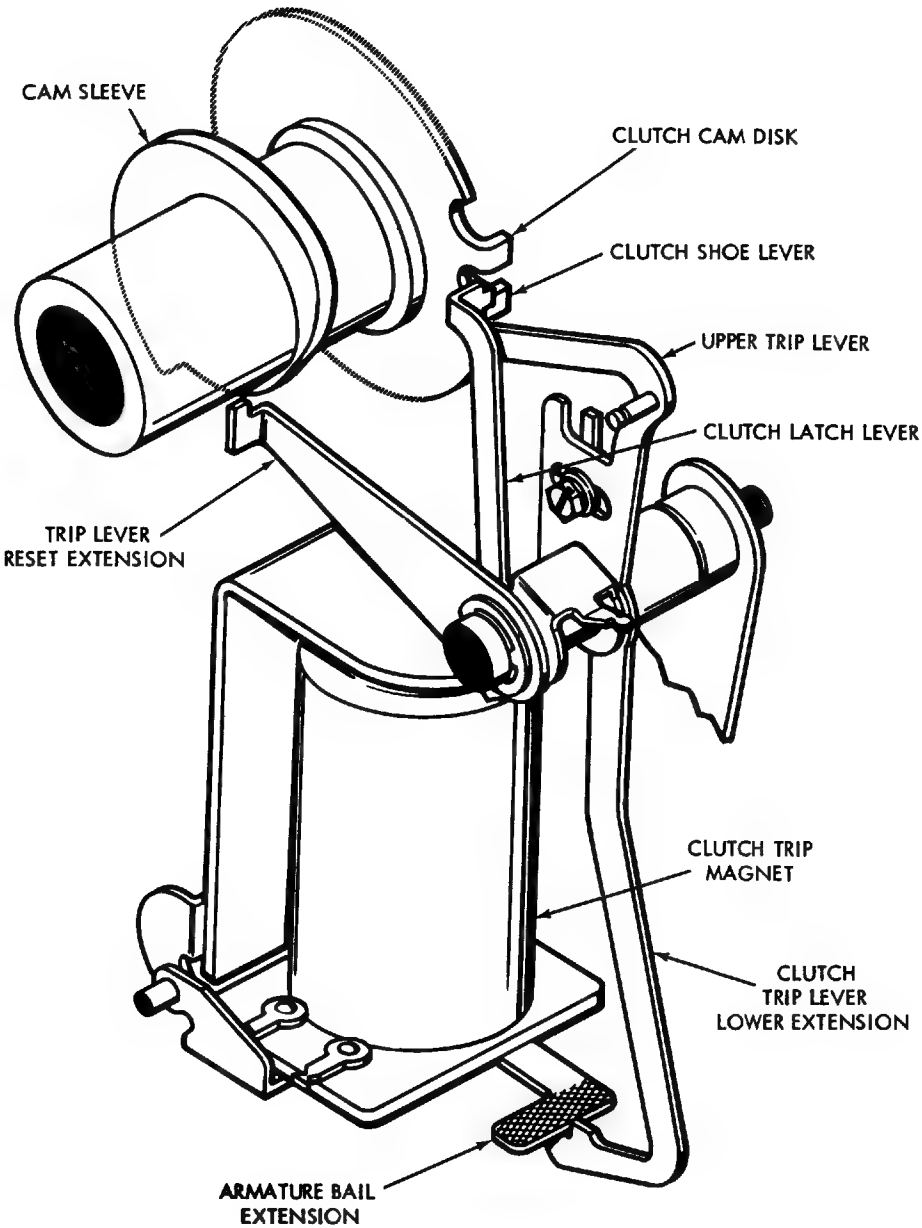


Figure 2-3. Clutch Trip Mechanism

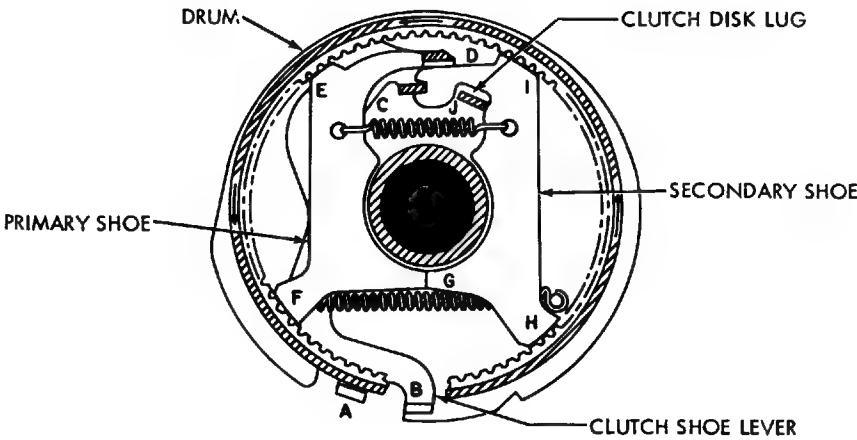


Figure 2-4. Clutch Engaged

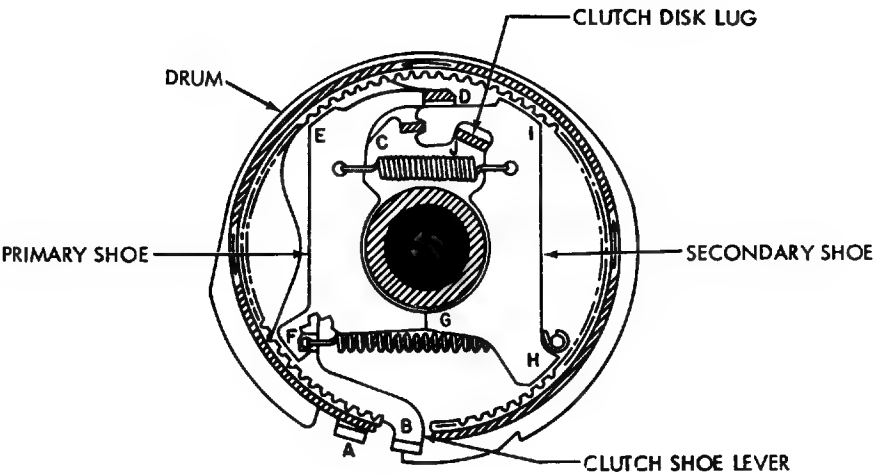


Figure 2-5. Clutch Disengaged

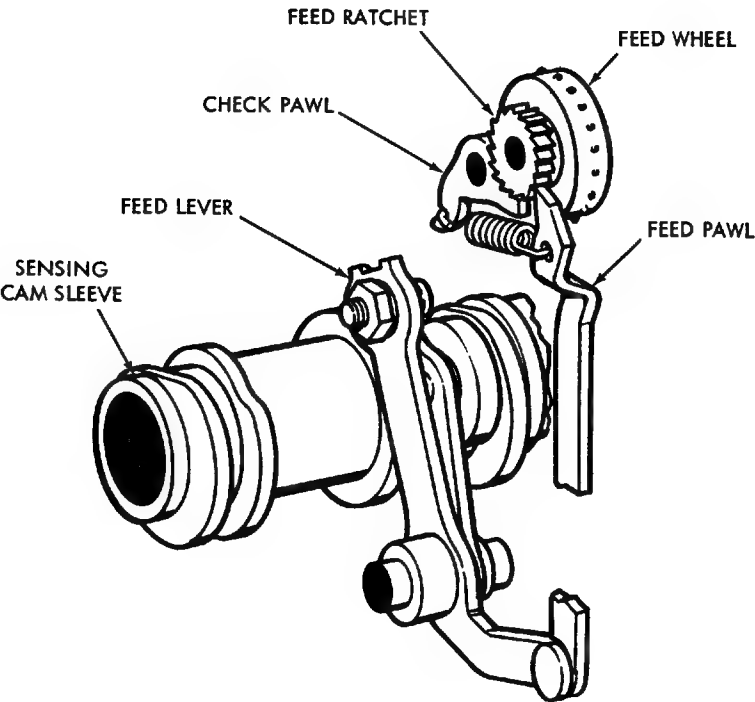


Figure 2-6. Tape-Feed Mechanism

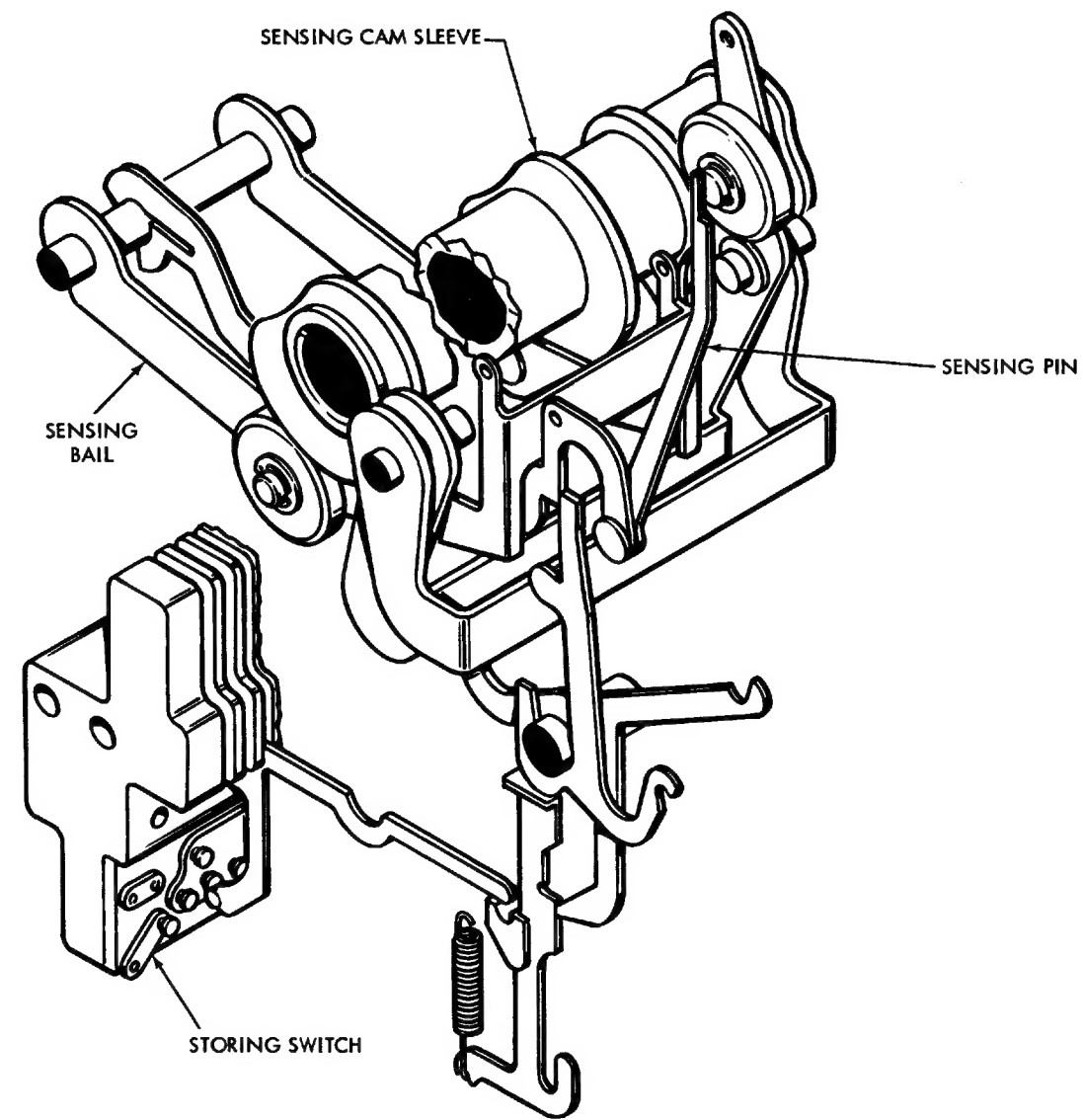


Figure 2-7. Tape Sensing

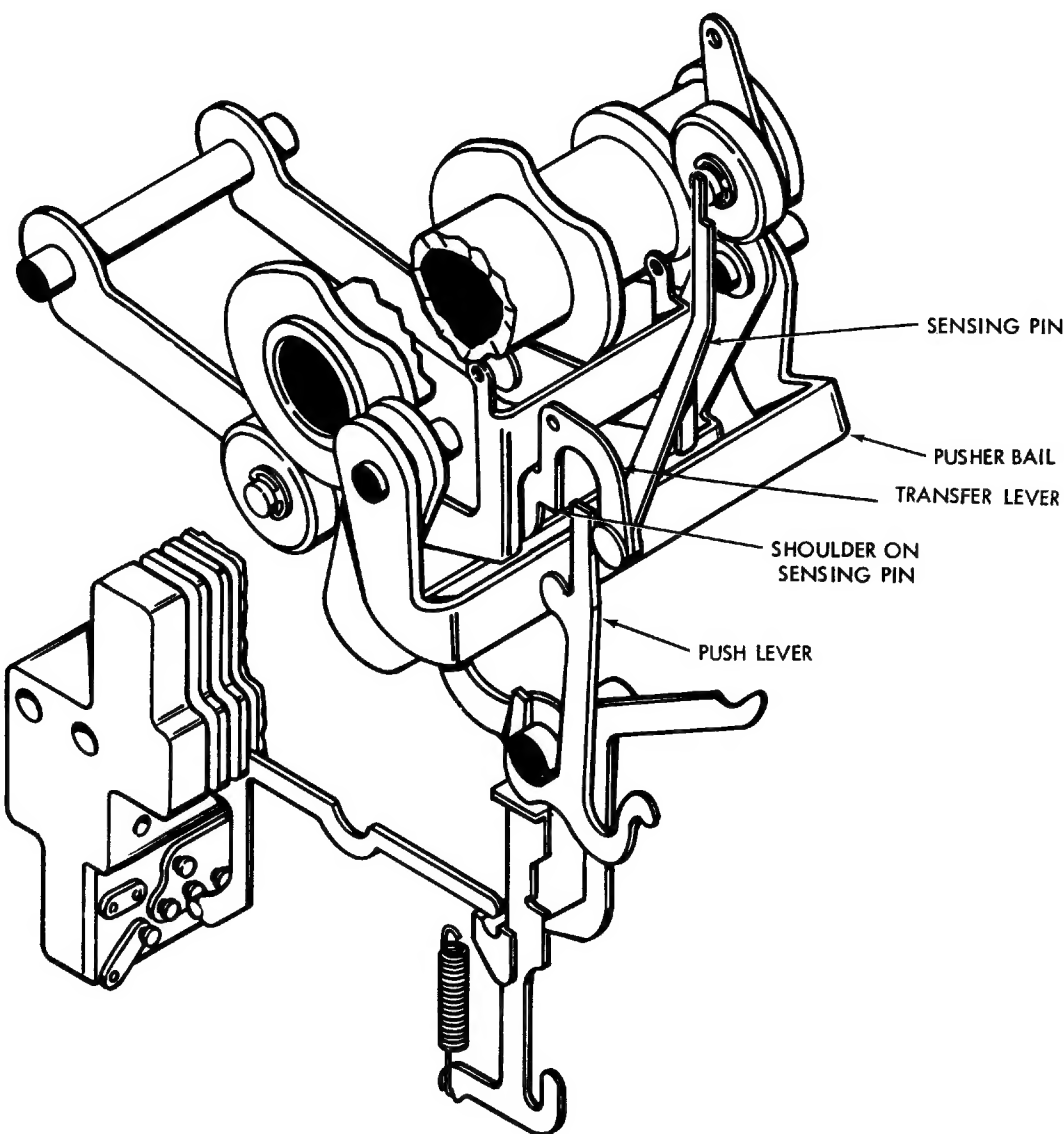


Figure 2-8. Pusher Bail

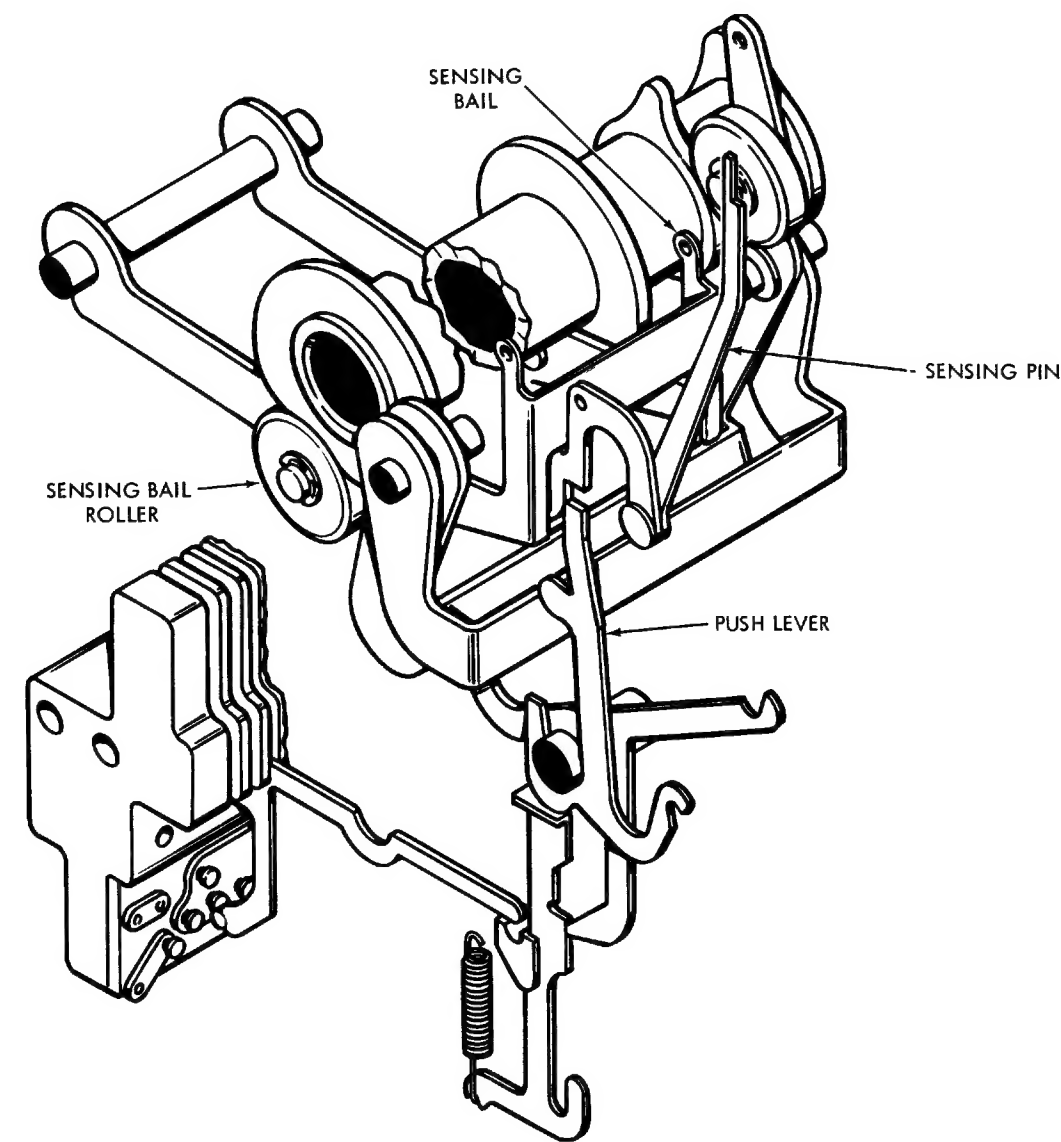


Figure 2-9. Sensing Bail

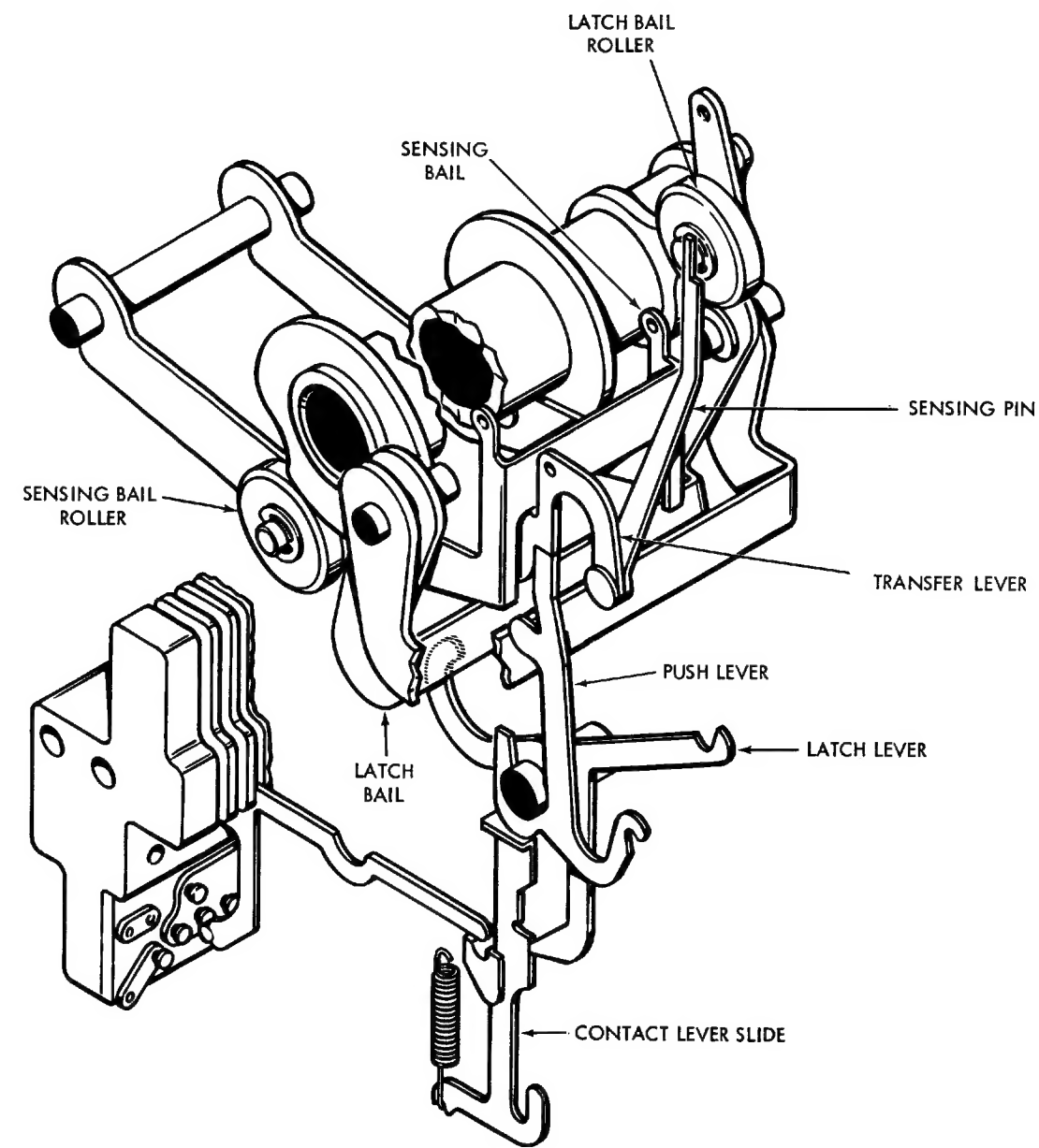


Figure 2-10. Latch Bail

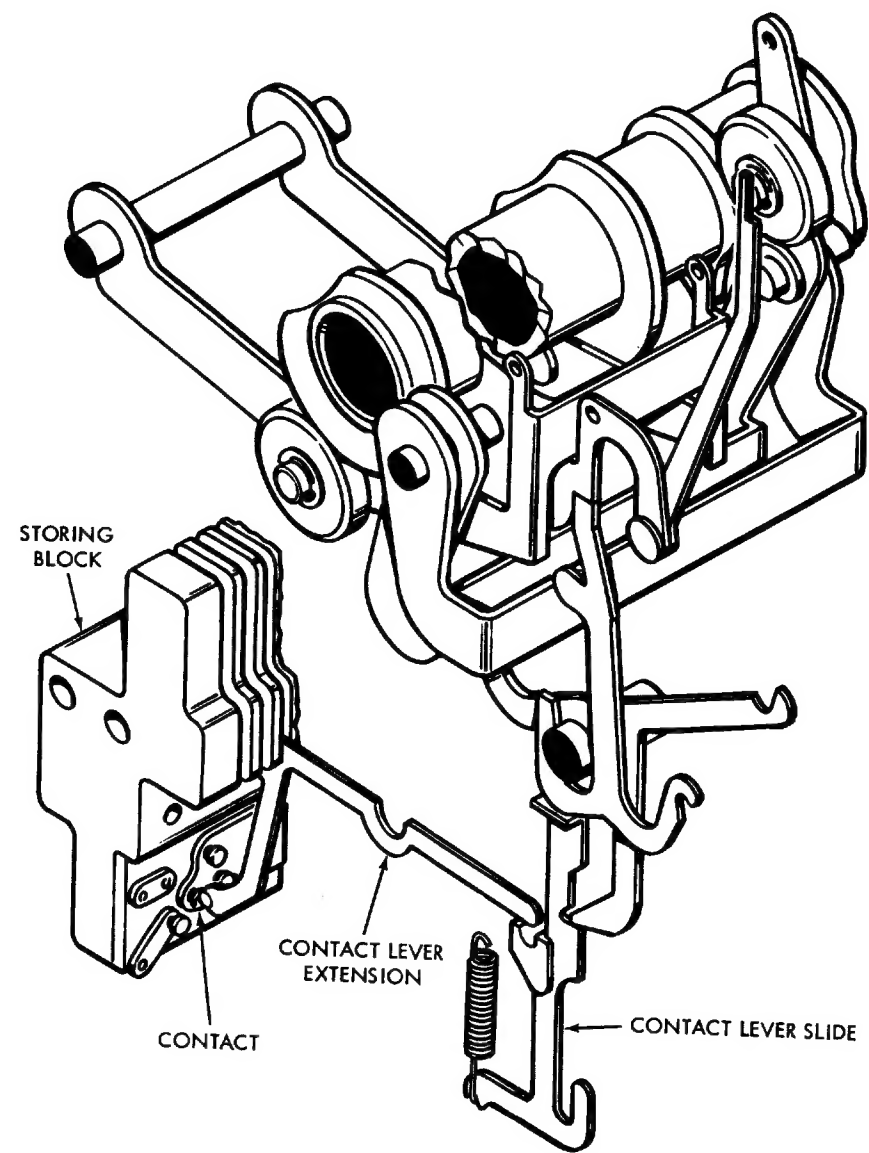


Figure 2-11. Storing Switch

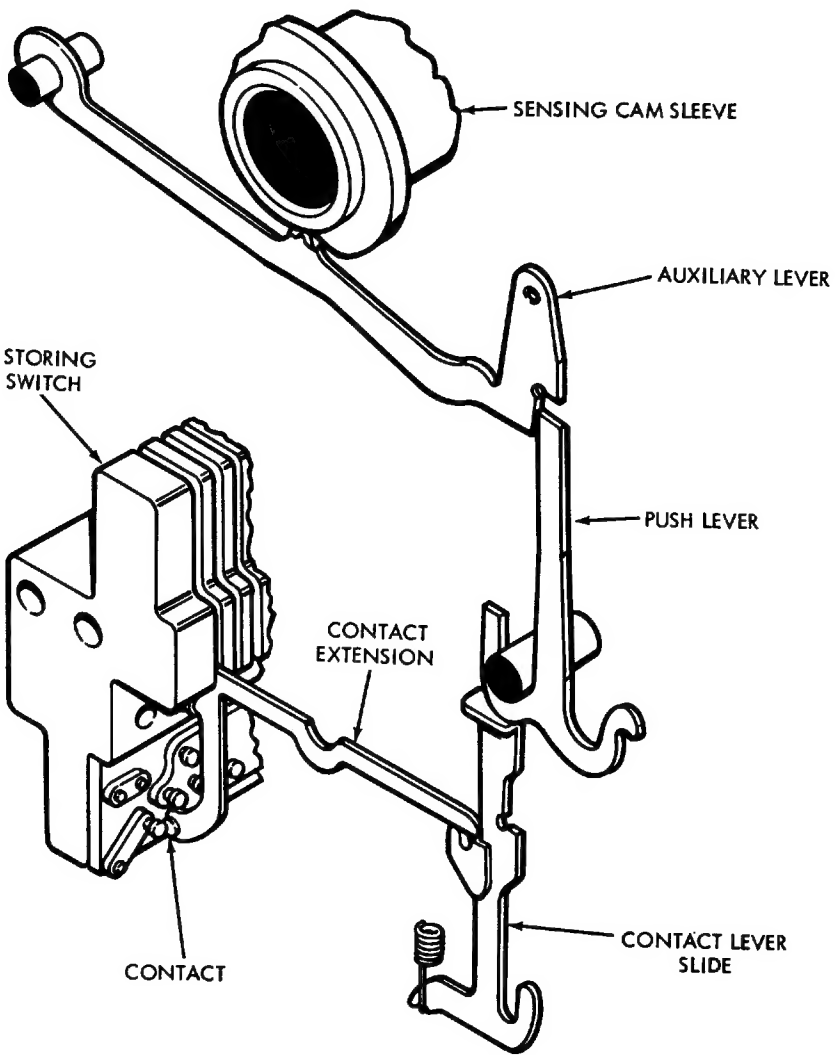


Figure 2-12. Auxiliary Contacts

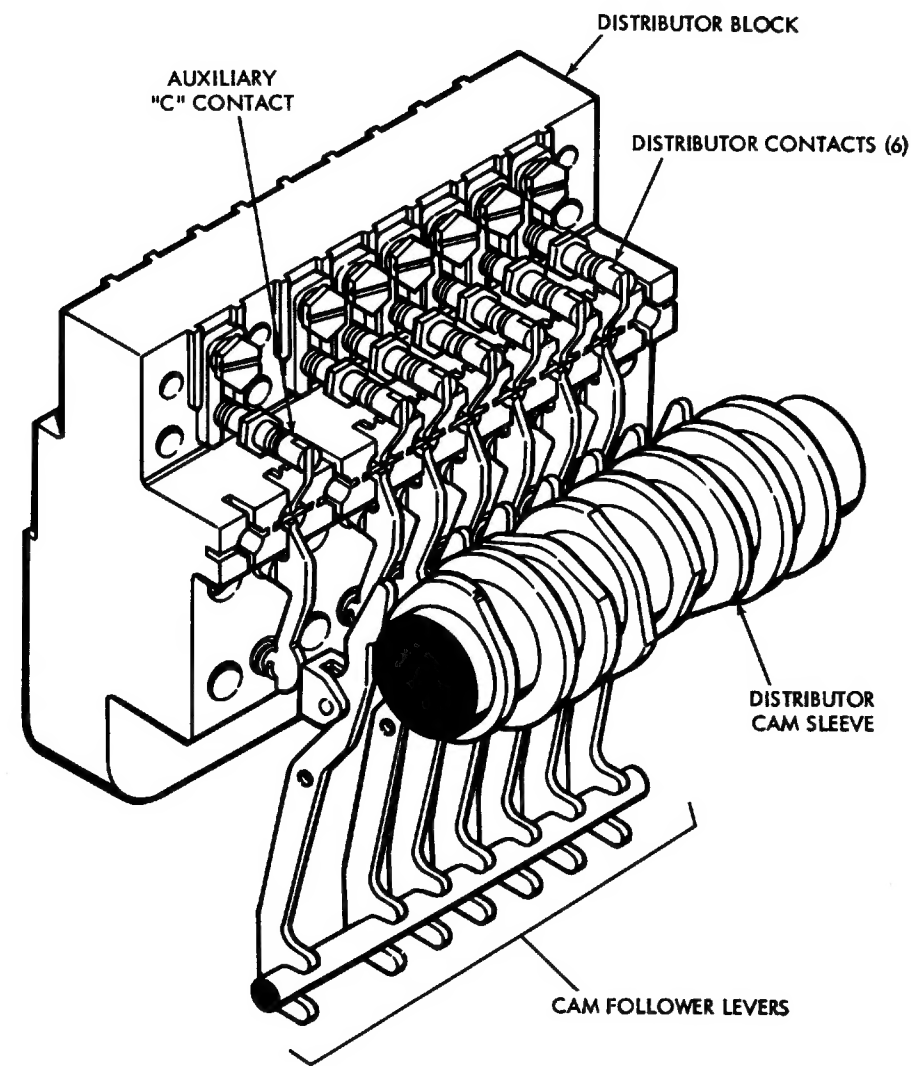
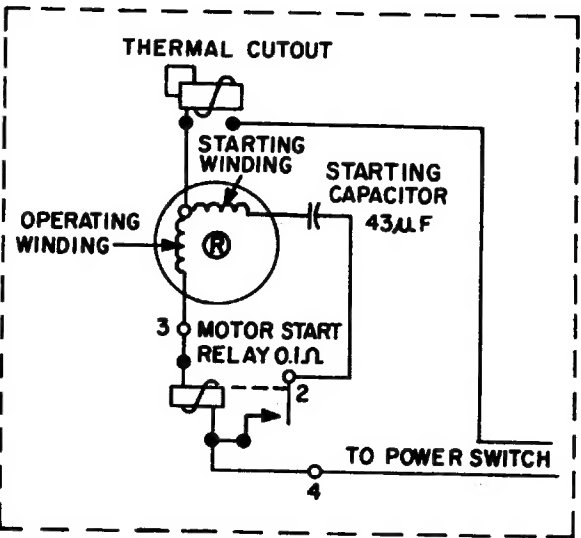
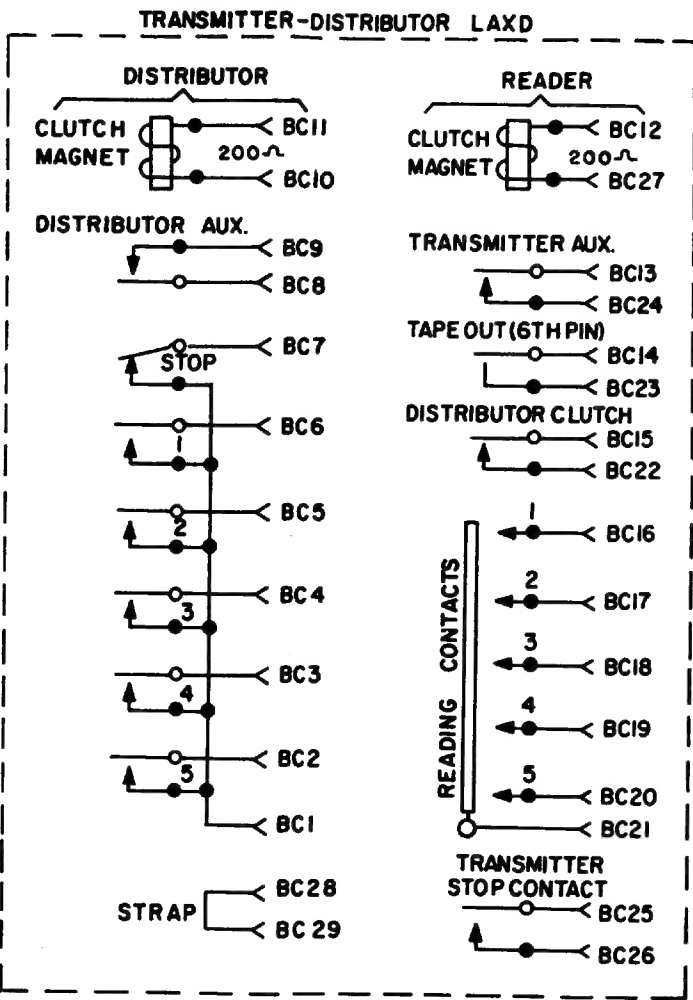


Figure 2-13. Distributor Mechanism



NOTE: Transmitter Distributor is driven through shafting by power from an associated unit, but could be driven independently by a motor, as shown in the above schematic.

Figure 2-14. Typical Wiring Diagram